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We refer our readers to the early papers on this subject in this Magazine, where an explanation of the terms used in these descriptions may be found.

The brevity of these papers is owing to their being intended principally for those who are making, or wish to make collections in this entertaining branch of natural history, and are offered as guides to them. Hopes are entertained that others may be led to form collections, from the brief hints thrown out respecting the hiding-places of these almost obscure animals. Many who spend their leisure time in solving illustrated riddles, and derive, as the result of their labor, simply an answer, would find that the expenditure of half the brain-work, if applied to the identification of the fruits of a day's ramble in the woods, would furnish not only a healthier intellectual enjoyment, but, with proper training, lead to an endless pleasure in the contemplation of the boundless wealth of creation.

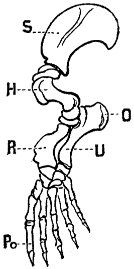
St. Augustine has truthfully written that "every species of animal has beauties peculiar to itself. The more man considers them, the more they engage him to adore the Author of Nature, who has made everything in wisdom, who has subjected everything to His power, and whose goodness governs the whole."

THE HAND AS AN UNRULY MEMBER.

BY BURT G. WILDER, M. D.

NATURAL HISTORY is not now the simple thing it was a century ago. Leaving out of view the two great departments of Botany and Mineralogy, it then consisted of a

Fig. 4.



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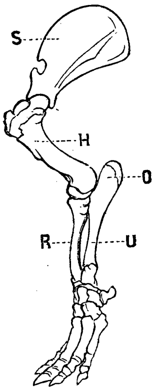

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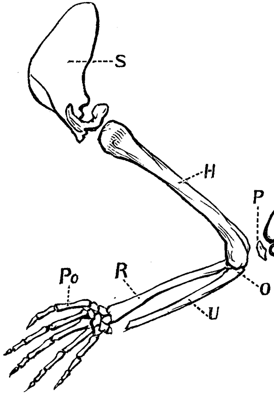

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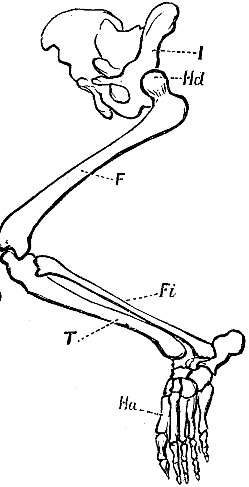

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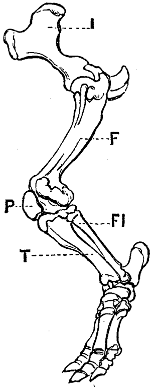

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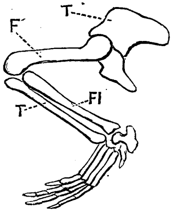

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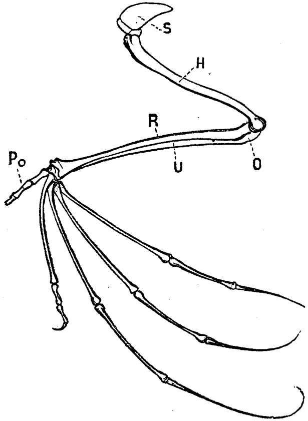

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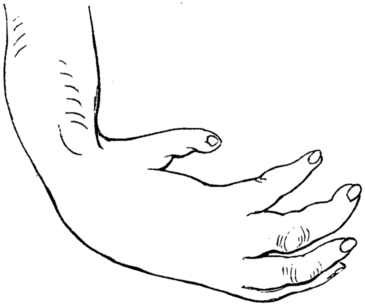


Fig. 10.

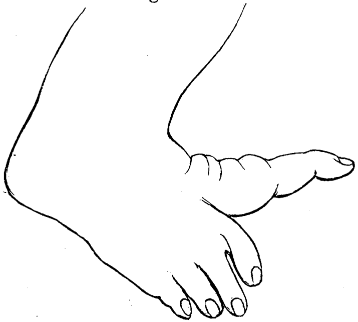
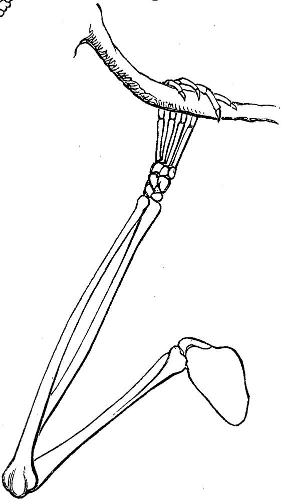


Fig. 5.



WILDER ON THE HAND.

limited and superficial acquaintance with the habits and external appearance of the few known animals; how few these were, as compared with those we now know, may be seen from this, that, in 1748, Linnæus enumerated *two hundred and eighty* different kinds of fish; at the present time, the Museum of Comparative Zoölogy at Cambridge, Mass., contains over *nine thousand* species of that class, about *twenty-two hundred* of which were collected in the late Thayer Expedition to Brazil.

So impossible is it for any one person to gain a thorough knowledge of all animals, that we find men devoting years, their lives almost, to the study of a single species;* while it is daily becoming more and more apparent, that in order to advance or even to keep up in modern science, each must devote himself principally to a few branches of Natural History.

To show how far this division of labor has already extended, take the single department of Comparative Anatomy, which embraces the following lines of study: 1. The anatomy of a single species considered by itself; as Anthropotomy, or human anatomy; Hippotomy, the anatomy of the horse, etc. When this kind of study is extended to the microscopic investigation of the structure of *tissues*, it is called Histology. 2. One or more species may be traced in their development and growth from their beginning as an egg to the adult condition, —this is Embryology. 3. We may enlarge our conception of the plan of creation, by comparing with the animals which now live the fossil remains of those which existed in past ages, this constituting the science of Palæontology. 4. Then comes Physiological Anatomy, which treats of organs in reference to their *functions;* and, lastly, there is what is called Homology, in which parts and organs are considered, not according to their *size*, or *shape*, or the specific functions which they perform, since these vary greatly in different species, but according to their *essential structure* and their *connections with other parts;* these last are called *morphological* characters, and they alone are sufficiently constant to serve as the basis of zoölogical classification. This branch of anatomy is generally followed with a view of determining and comparing corresponding or homologous organs in *different animals*, but the same methods may be employed in another way, which has been in existence for hardly a century, and for which no name has yet been fully accepted; it consists in the *determination and comparison of corresponding parts in different regions of the same individual.*

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*For instance, the "Anatomie descriptive et comparative du Chat," by Straus-Durckheim, 1845, comprising two quarto volumes of text and a large folio atlas of plates, yet treating of only the bones, the ligaments, and the muscles. Also, the "Traité de la Chenille qui ronge le Bois de Saule" (larva of the goat-moth, or Cossus ligniperda), by Pierre Lyonnet, 1760; a quarto volume of 615 pages and eighteen plates.

To illustrate the distinction between these two kinds of Homology, by reference to familiar objects, the former would compare the foremast of one ship with that of another, and note their difference in the size and proportion of the various pieces; while the latter would compare the foremast with the mainmast of the same ship, pointing out their resemblance, and the differences in the length of the various pieces.

It is to this latter kind of anatomy that I propose to call attention, and have chosen for a subject an organ which, though small, is most comprehensive, gathering within its grasp far more than can be illustrated in this short article,—the Hand.

It is a time-honored theme, and he stands in great danger of repetition who takes for his subject a part of our corporeal frame, concerning which there has been written by men of science, preached by divines, and even sung by poets, more than of any other organ, excepting, perhaps, the eye. He would indeed be most presuming who should, without the reputation and consciousness of most profound knowledge, undertake to more than express his concurrence in what has been already said concerning the beauty of form, the complexity of structure, the marvellous skill, and the wonderful diversity of function which characterize the human hand.

There is, however, a view of the subject to which little attention has been paid by those who have treated it, but a correct idea of which is really essential to the fullest appreciation of the wonders so eloquently set forth by Sir Charles Bell,* and by anatomists generally,—a view in which the human hand, while furnishing to the student of *final causes*, to the *teleologist*, his most perfect illustration of the adaptation of means to desired ends, becomes to the *morphologist*, to the student of *unity of type* under diversity of form and function, a fruitful source of anxiety, and even, as will be seen, of serious error.

So widely spread and so deeply rooted is this error, and so almost wholly is it due to the peculiar structure and endowments of the hand, that we are justified in drawing a comparison between it and that other organ whereof the Apostle wrote,—"Even so the tongue is a little member. . . . . It is an unruly evil, full of deadly poison."

Now it is evident that by *tongue* in this connection is by no means indicated the mere anatomical organ which all vertebrates carry in the floor of the mouth, composed of certain muscles, supported by certain bones, and supplied with nerves of motion and of sensation. We are indeed right in applying the *name* tongue to the fleshy pad in the mouth of the fish, to the prehensile fly-catcher of the chameleon, to the barbed harpoon of the woodpecker, and the glutinous snare of the ant-eater, thus recognizing in a cold, scientific way, their anatomical or *morphological* identity with the corresponding organ in the human body. But this last alone is used as a synonym for language; it alone is the facile medium of ideas, as well as of sensations; it alone has entered the service of an immortal soul, and is characteristic of man.

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*In his admirable Bridgewater Treatise on the Hand.

So with the hand. We recognize the same bones which form our upper limb (Fig. 1) in the foreleg of the quadruped (Fig. 2), in the wing of the bird and of the bat (Fig. 3), in the flipper of the seal (Fig. 4), and still more strikingly in the so-called *arm* of the ape (Fig. 5); and though the forefoot of the bear is merely a *paw* when supporting his ungainly bulk upon the earth, yet when it is flourished in the air as he sits erect upon his haunches, we are glad to escape the blow of what is then admitted to be a tolerable imitation of a hand.* And yet it is not really such; for if the presence of a thumb, capable of being opposed to the tips of any or all the fingers, is the distinguishing feature of a hand, we shall look for it in vain throughout the whole animal kingdom below man; for even in the gorilla the first digit, though strong, is short, and reaches only to the knuckle of the forefinger (Fig. 6), while in many of the lower monkies it is altogether wanting, and when present in quadrupeds is so intimately connected with the other digits as to have no independent motion.

We may assume, then, that the tongue and the hand, not in the anatomical or morphological, but in the functional or teleological sense, are the really characteristic organs of man, corresponding with his peculiar endowments of rationality in thought, and freedom in action; and so it is not a little significant that to these same organs alone, which, being the most capable of good, are, by perversion, the most potent for evil, can the term *unruly* properly be applied. For they are, either singly or together, the chief ground of discussion as to "man's place in nature," showing him to be a most unruly member of the animal kingdom; they are the agents of the individual in becoming an unruly member of society, and they are, or represent, those regions of the body whose relations to other parts have ever caused the greatest trouble among the students of Philosophical Anatomy.*

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*As in Pliny, 8. 36. 54.

Leaving to the zoölogist, the moralist, and the historian, the consideration of their respective claims to the "bad preëminence," and confining our attention to one of them, it may also be said that not only is the hand, as a whole, the main element in the discussion to which I have referred, but that the very heat and fierceness of the strife has always centred upon the most characteristic part of this characteristic organ of humanity,—the thumb.

But it is asked, What is this terrible discussion all about, and what is the matter with our hands, and especially with our thumbs?

In brief, a careful study of the anterior limbs of vertebrate animals having shown that all are built upon one general plan, but varied in form and proportion to suit the special needs of man, of the beast, the bird, and the reptile, and a like survey of the posterior limbs having shown the same to be the case with them (Figs. 7, 8, 9), so that they all present different degrees of homology or morphological relationship, our anatomical pioneers have conceived that a *similar correspondence prevails between the anterior and posterior limbs themselves;* so that not only is the shoulder, at one end of the body, merely a repetition of the pelvis at the other, but the arm as far as the elbow is seen in the thigh with the knee, the forearm in the leg, the wrist in the ankle-joint, and the hand, alas, in the foot,—"Pes altera manus."*

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*See the various and diverse theories of the skull, especially the antagonistic ones of Owen, "On the Archetype and Homologies of the Vertebrate Skeleton;" Report of the British Association for 1846; and Huxley, "Elements of Comparative Anatomy."

But here, *in extremitatum extremis*, humanity rebels. Science has gone far enough in proving that, for purposes of rational comparison and anatomical inquiry, man must assume a horizontal position on all-fours like a beast, so that his arms and legs become mere "anterior and posterior extremities;" after which degradation he can indeed arise and resume the attitude proper to the lord of creation. But to his upper and nobler parts this last comparison is most odious. They entreat us with clasped hands, they threaten us with clenched fist; they would flee from the threatened contamination; they would sit in sullen scorn at the degrading fellowship: but neither active or passive resistance is possible without the aid of the despised member, and so by slow degrees it is granted that the *ilium* (Fig. 7 I) does look very like a *scapula* (Fig. 1 S); that the *femur*, or thigh-bone (F), bears a wonderful resemblance to the *humerus*, or bone of the arm (H); that the knee-pan (P) is quite as exposed a part as the elbow; and that, perhaps, the taper forearm is only a better view of the "calf" of the leg; but as for admitting between the hand, —

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*These are the closing words of the first treatise upon this subject,—a paper by Felix Vicq d'Aryr. Œuvres recuilles par Moreau, 1805, Vol. IV. p. 37. Mems. de la Academie Royale des Sciences, 1794.

> "Her hand,
> In whose comparison all white are ink,
> Writing their own reproach; to whose soft seizure
> The cygnet's down is harsh, and spirit of sense
> Hard as the palm of ploughman," —

any equality whatever with the foot, which is so ugly that here, as well as at the antipodes, the bootmaker's skill and our own endurance are taxed to their utmost to force it into proper shape; this is too much, and not to be allowed.

And here it may be added that the foot presents, in this respect, a contrast with the hand, not only physical, but, as it were, metaphysical; for it is plain, honest, and inoffensive, and, though much abused, shows no disposition to become an unruly member. In ancient times, indeed, warriors did cut off the great toes as well as the thumbs of their captives, but the toes are the only part of the body thrown into disuse by modern civilization, while the fingers are cherished and exalted to the highest degree. The foot is the hand's poor relation, and, though not ambitious to share its high offices which nevertheless it has often shown itself capable of discharging to an astonishing degree, yet claims, and justly too, its right in the family name.

But no; the haughty hand heeds not the humble foot, and at length, with the single warning, that, in case any remote cousinship is proved between them, the thumb has sworn to admit into his society only the great toe, which, like himself, has but two joints, and in the ape (Fig. 10) does bear him some slight resemblance, distressed humanity resigns the whole affair to the comparative anatomist. And now, after a hundred years of controversy, comparative anatomy presents her report, admitting with shame, that, in spite of their meagre number, scarce two of her votaries can agree upon any one point, and that only two or three have ventured to disregard the abovementioned threat on the part of the thumb. It will be seen, however, that while thus heeding the wish of that powerful constituent of the more aristocratic member, there has been a general though tacit recognition of the good conduct and sobriety displayed by its humbler representative, so that, with one notable exception,* the lower limb has been left unmolested, while the more pretentious arm has suffered all the pangs of dislocation, misplacement, twisting, and compound fracture, as the consequence of the thumb's stubborn pride.

A brief sketch of such portions of the controversy as best illustrate the unruly character of the hand, it is my purpose to lay before the reader in succeeding articles.

EXPLANATION OF FIGURES ON PLATE 11.

In all the figures, S denotes the *Scapula*, or shoulder-blade; I, the shin or chief bone of the pelvis; H, the *Humerus*, or bone of the upper arm; F, the *Femur*, or thigh bone, the corresponding bone of the leg; O, the *Olecranon process*, which forms the tip of the elbow; P, the *Patella*, or knee-pan; U, the *Ulna*, or inner bone of the forearm; T, the *Tibia*, or inner bone of the leg; R, the *Radius*, or outer bone of the forearm, which supports the thumb when there is one; and Fi, the *Fibula*, or outer bone of the leg. The hand and foot are easily distinguished in all the limbs; but Po, indicates the *Pollex*, or thumb, and Ha, the *Hallex*, or great toe.

Fig. 1. Arm of Man, as it is when we get down upon "all-fours."

Fig. 2. Foreleg of Tapir; it has no thumb, and is, of course, much thicker and stronger, but otherwise corresponds quite closely with the human arm.

Fig. 3. Wing of the Bat. The scapula is very small, but the other

bones, especially the fingers, are very long and slender, to support the thin web.

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*In which both thumb and great toe are considered too large, and are split in twain, so as to correspond, the one to the two lesser toes, and the other to the two lesser fingers.

Fig. 4. Foreleg or "flipper" of Seal; the bones are in great contrast with the last, but the same parts are represented.

Fig. 5. Arm of a Monkey, which has no thumb.

Fig. 6. Hand of the Gorilla; the thumb smaller than in man.

Fig. 7. Leg of Man.

Fig. 8. Hind leg of Tapir.

Fig. 9. Hind leg of Alligator.

In these three figures it is easy to trace the corresponding bones, as in Figs. 1, 2, 3, and 4.

Fig. 10. Foot of Gorilla; the great toe very large, and standing off from the others like a thumb.

By comparing Figs. 1, 2, and 4, with Figs. 7, 8, and 9, one can hardly fail to see that not only are there corresponding segments in the fore and hind limb, but also that, except in case of the hand and foot, these corresponding segments point in *opposite directions*, so that the three figures on one side are, to those on the other, as three right arms to three left arms; they are *symmetrical*.

THE CLOTHES-MOTH.

BY A. S. PACKARD, JR., M. D.

For over a fortnight we once enjoyed the company of the caterpillar of a common Clothes-moth. It is a little pale, delicate worm (Fig. 1), about the size of a darning needle, not half an inch long, with a pale horn-colored head, the ring next the head being of the same color, and has sixteen feet, the first six of them well developed and constantly in use to draw the slender body in and out of its case. Its head is armed with a formidable pair of jaws, with which, like a scythe, it mows its way through thick and thin.

Fig. 3.

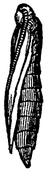

Fig. 2.

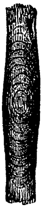

Fig. 1.